SEQ ID NO: 1. RAG1 Nucleotide Sequence

gagagcagag aacacacttt gcettetett tggtattgag taatatcaac caaattgcag acatetcaac actttggcca ggcagcctgc tgagcaaggt acctcagcca gcatggcagc ctctttccca cccaccttgg gactcagttc tgccccagat gaaattcagc acccacatat taaattttca gaatggaaat ttaagctgtt ccgggtgaga tcctttgaaa agacacetgaagaageteaa aaggaaaaga aggatteett tgaggggaaa eeetetetgg agcaateteeageagteetg gacaaggetg atggteagaa geeagteeca acteageeat tgttaaaage ceaccetaag tttteaaaga aattteaega caacgagaaa gcaagaggca aagcgatcca tcaagccaac cttcgacatc tctgccgcat ctgtgggaat tcttttagag ctgatgagca caacaggaga tatccagtcc atggtcctgt ggatggtaaa accctaggcc ttttacgaaa gaaggaaaag agagctactt cetggeegga ceteattgee aaggttttee ggategatgt gaaggeagat gttgactega teeacceac tgagttetge cataactget ggagcateat geacaggaag tttageagtg eeceatgtga ggtttaette eegaggaaeg tgaccatgga gtggcacccc cacacaccat cctgtgacat ctgcaacact gcccgtcggg gactcaagag gaagagtett eagecaaaet tgeageteag eaaaaaaete aaaaetgtge ttgaceaage aagacaagee egteagegea agagaagage teaggeaagg ateageagea aggatgteat gaagaagate geeaactgea gtaagataca tettagtace aageteettg eagtggaett eecagageae tttgtgaaat eeateteetg eeagatetgt gaacacattc tggctgaccc tgtggagacc aactgtaagc atgtcttttg ccgggtctgc attctcagat gcctcaaagt catgggcage tattgteect ettgeegata teeatgette eetaetgace tggagagtee agtgaagtee tttetgageg tettgaatte eetgatggtg aaatgteeag eaaaagagtg eaatgaggag gteagtttgg aaaaatataa teaceacate tcaagtcaca aggaatcaaa agagattttt gtgcacatta ataaaggggg ccggcccgc caacatcttc tgtcgctgac teggagaget cagaageace ggetgaggga getcaagetg caagtcaaag cetttgetga caaagaagaa ggtggagatg tgaagtccgt gtgcatgacc ttgttcctgc tggctctgag ggcgaggaat gagcacaggc aagetgatga getggaggee atcatgeagg gaaagggete tggeetgeag eeagetgttt gettggeeat ccgtgtcaac accttcctca gctgcagtca gtaccacaag atgtacagga ctgtgaaagc catcacaggg agacagattt ttcagcettt geatgeeett eggaatgetg agaaggtaet tetgeeagge taccaccact ttgagtggea gecacctetg aagaatgtgt etteeageae tgatgttgge attattgatg ggetgtetgg actateatee tetgtggatg attaceeagt ggacaccatt gcaaagaggt tccgctatga ttcagctttg gtgtctgctt tgatggacat ggaagaagac atcttggaag gcatgagate ccaagacett gatgattace tgaatggeee etteaetgtg gtggtgaagg agtettgtga tggaatggga gacgtgagtg agaagcatgg gagtgggcct gtagttccag aaaaggcagt ccgtttttca ttcacaatca tgaaaattac tattgeceae ageteteaga atgtgaaagt atttgaagaa gecaaaceta aetetgaaet gtgttgeaag eeattgtgee ttatgetgge agatgagtet gaccaegaga egetgaetge eateetgagt eeteteattg etgagaggga ggecatgaag agcagtgaat taatgettga getgggagge atteteegga ettteaagtt eatetteagg ggeaeegget atgatgaaaa acttgtgcgg gaagtggaag gcctcgaggc ttctggctca gtctacattt gtactctttg tgatgccacc cgtctggaag ceteteaaaa tettgtette eaetetataa eeagaageea tgetgagaac etggaaegtt atgaggtetg gegtteeaac cettaccatg agtetgtgga agaactgcgg gategggtga aaggggtete agetaaacet tteattgaga eagteeette catagatgca ctccactgtg acattggcaa tgcagctgag ttctacaaga tcttccagct agagataggg gaagtgtata agaatcccaa tgcttccaaa gaggaaagga aaaggtggca ggccacactg gacaagcatc tccggaagaa gatgaacete aaaceaatea tgaggatgaa tggcaacttt geeaggaage teatgaceaa agagaetgtg gatgeagttt gtgagttaat teetteegag gagaggeaeg aggetetgag ggagetgatg gatetttaee tgaagatgaa accagtatgg cgatcatcat gecetgetaa agagtgeeca gaateeetet gecagtacag ttteaattea eagegttttg etgageteet ttctacgaag ttcaagtata ggtatgaggg aaaaatcacc aattattttc acaaaaccct ggcccatgtt cctgaaatta ttgagaggga tggctccatt ggggcatggg caagtgaggg aaatgagtct ggtaacaaac tgtttaggcg etteeggaaa atgaatgeea ggeagteeaa atgetatgag atggaagatg teetgaaaca eeactggttg tacaceteea aatacctcca gaagtttatg aatgctcata atgcattaaa aacctctggg tttaccatga accctcaggc aagcttaggg gacccattag gcatagagga ctctctggaa agccaagatt caatggaatt ttaagtaggg caaccactta tgagttggtt tttgcaattg agtttccctc tgggttgcat tgagggcttc tcctagcacc ctttactgct gtgtatgggg cttcaccatc caagaggtgg taggttggag taagatgcta cagatgctct caagtcagga atagaaactg atgagctgat tgcttgaggc ttttagtgag ttccgaaaag caacaggaaa aatcagttat ctgaaagctc agtaactcag aacaggagta actgcagggg accagagatg agcaaagatc tgtgtgtgtt ggggagctgt catgtaaatc aaagccaagg ttgtcaaaga acagccagtg

aggccagaaa ttggtcttgt ggttttcatt tttttccccc ttgattgatt atattttgta ttgagatatg ataagtgcct totattteat tittgaataa tietteatti tiataattit acatatetig getigetata taagatteaa aagagetiit taaattiite taataatate ttacattigt acagcatgat gacetttaca aagtgetete aatgcattta eccattegtt atataaatat gttacatcag gacaactttg agaaaatcag teettttta tgtttaaatt atgtatetat tgtaacette agagtttagg aggtcatctg ctgtcatgga tttttcaata atgaatttag aatacacctg ttagctacag ttagttatta aatcttctga taatatatgt ttacttagct atcagaagcc aagtatgatt ctttattttt actttttcat ttcaagaaat ttagagtttc caaatttaga gettetgeat acagtettaa agecacagag gettgtaaaa atataggtta gettgatgte taaaaatata tttcatgtct tactgaaaca ttttgccaga ctttctccaa atgaaacctg aatcaatttt tctaaatcta ggtttcatag agtectetee tetgeaatgt gttattettt etataatgat eagtttaett teagtggatt eagaattgtg tageaggata accttgtatt tttccatccg ctaagtttag atggagtcca aacgcagtac agcagaagag ttaacattta cacagtgctt tttaccactg tggaatgttt tcacactcat ttttccttac aacaattctg aggagtaggt gttgttatta tctccatttg atgggggttt aatgatttgc tcaaagtcat ttaggggtaa taaatacttg gcttggaaat ttaacacagt ccttttgtct ccaaagccct tettetttee accaeaaatt aateactatg tttataaggt agtateagaa tttttttagg atteacaact aatcactata gcacatgacc ttgggattac attittatgg ggcaggggta agcggctttt aaatcatttg tgtgctctgg ctcttttgat agaagaaagc aacacaaaag ctccaaaggg ccccctaacc ctcttgtggc tccagttatt tggaaactat gatetgeate ettaggaate tgggatttge eagttgetgg eaatgtagag eaggeatgga attttatatg etagtgagte ataatgatat gitagtgita attagtitit citccitiga tittatigge cataatiget acteticata cacagtatat caaagagett gataatttag ttgtcaaaag tgcatcggcg acattatett taattgtatg tatttggtgc ttettcaggg attgaactca gtatetttea ttaaaaaaca cageagtttt cettgetttt tatatgeaga atateaaagt catttetaat ttagttgtca aaaacatata catattttaa cattagtttt tttgaaaact cttggttttg tttttttgga aatgagtggg ccactaagcc acactttccc ttcatcctgc ttaatccttc cagcatgtct ctgcactaat aaacagctaa attcacataa teatectatt taetgaagea tggteatget ggtttataga ttttttaece atttetaete ttttteteta ttggtggeae tgtaaatact ttccagtatt aaattatcct tttctaacac tgtaggaact attttgaatg catgtgacta agagcatgat ttatagcaca acetttecaa taateeetta ateagateae attitgataa aceetgggaa catetggetg eaggaattte aatatgtaga aacgctgcct atggtttttt geeettactg ttgagactge aatateetag accetagttt tatactagag ttttattttt agcaatgeet attgeaagtg caattatata etceagggaa atteaceaea etgaategag cattigtgtg tgtatgtgtg aagtatatet gggaetteag aagtgeaatg tatttttete etgtgaaace tgaatetaea agttttetge caagccactc aggtgcattg cagggaccag tgataatggc tgatgaaaat tgatgattgg tcagtgaggt caaaaggagc cttgggatta ataaacatgc actgagaagc aagaggagga gaaaaagatg tctttttctt ccaggtgaac tggaatttag ttttgcctca gatttttttc ccacaagata cagaagaaga taaagatttt tttggttgag agtgtgggtc ttgcattaca tcaaacagag ttcaaattcc acacagataa gaggcaggat atataagcgc cagtggtagt tgggaggaat aaaccattat ttggatgcag gtggtttttg attgcaaata tgtgtgtgtc ttcagtgatt gtatgacaga tgatgtattc ttttgatgtt aaaagatttt aagtaagagt agatacattg tacccatttt acattttctt attttaacta cagtaatcta cataaatata ceteagaaat eattittggt gattattitt tgttitgtag aattgeaett eagtitatit teltacaaat aacettacat ttigtttaat ggetteeaag ageettitti tittigtati teagagaaaa tieaggtaee aggatgeaat ggattiatti gattcagggg acctgtattt ccatgtcaaa tgttttcaaa taaaatgaaa tatgagtttc aatacttttt atattttaat attteettaa tattatggtt attgteegee attttgttgt atattgtaaa taaagtttag attgt

SEQ ID NO: 2.

RAG 1 Amino acid sequence

MAASFPPTLGLSSAPDEIQHPHIKFSEWKFKLFRVRSFEKTPEEAQKEKKDSFEGK PSLEOSPAVLDKADGQKPVPTQPLLKAHPKFSKKFHDNEKARGKAIHQANLRHL CRICGNSFRADEHNRRYPVHGPVDGKTLGLLRKKEKRATSWPDLIAKVFRIDVK ADVDSIHPTEFCHNCWSIMHRKFSSAPCEVYFPRNVTMEWHPHTPSCDICNTAR RGLKRKSLOPNLOLSKKLKTVLDOAROARORKRRAOARISSKDVMKKIANCSKI HLSTKLLAVDFPEHFVKSISCQICEHILADPVETNCKHVFCRVCILRCLKVMGSY CPSCRYPCFPTDLESPVKSFLSVLNSLMVKCPAKECNEEVSLEKYNHHISSHKES KEIFVHINKGGRPRQHLLSLTRRAQKHRLRELKLQVKAFADKEEGGDVKSVCM TLFLLALRARNEHRQADELEAIMQGKGSGLQPAVCLAIRVNTFLSCSQYHKMYR TVKAITGRQIFQPLHALRNAEKVLLPGYHHFEWQPPLKNVSSSTDVGIIDGLSGL SSSVDDYPVDTIAKRFRYDSALVSALMDMEEDILEGMRSQDLDDYLNGPFTVVV KESCDGMGDVSEKHGSGPVVPEKAVRFSFTIMKITIAHSSQNVKVFEEAKPNSEL CCKPLCLMLADESDHETLTAILSPLIAEREAMKSSELMLELGGILRTFKFIFRGTG YDEKLVREVEGLEASGSVYICTLCDATRLEASONLVFHSITRSHAENLERYEVW RSNPYHESVEELRDRVKGVSAKPFIETVPSIDALHCDIGNAAEFYKIFOLEIGEVY KNPNASKEERKRWOATLDKHLRKKMNLKPIMRMNGNFARKLMTKETVDAVC ELIPSEERHEALRELMDLYLKMKPVWRSSCPAKECPESLCQYSFNSQRFAELLST KFKYRYEGKITNYFHKTLAHVPEIIERDGSIGAWASEGNESGNKLFRRFRKMNA RQSKCYEMEDVLKHHWLYTSKYLQKFMNAHNALKTSGFTMNPQASLGDPLGI **EDSLESODSMEF** 

SEQ ID NO: 3,

RAG2 nucleotide sequence

actetettta cagteageet tetgettgee acagteatag tgggeagtea gtgaatette eccaagtget gacaattaat acctggttta gcggcaaaga ttcagagagg cgtgagcagc ccctctggcc ttcagacaaa aatctacgta ccatcagaaa ctatgtctct gcagatggta acagtcagta ataacatagc cttaattcag ccaggettct cactgatgaa ttttgatgga caagttttct tctttggaca aaaaggctgg cccaaaagat cctgcccac tggagttttc catctggatg taaagcataa ccatgtcaaa ctgaagccta caattttctc taaggattcc tgctacctcc ctcctcttcg ctacccagcc acttgcacat tcaaaggcag cttggagtct gaaaagcatc aatacatcat ccatggaggg aaaacaccaa acaatgaggt ttcagataag atttatgtca tgtctattgt ttgcaagaac aacaaaaagg ttacttttcg ctgcacagag aaagacttgg taggagatgt teetgaagee agatatggte atteeattaa tgtggtgtae ageegaggga aaagtatggg tgetetettt ggaggacget catacatgee ttetacceae agaaccacag aaaaatggaa tagtgtaget gaetgeetge eetgtgtttt cctggtggat tttgaatttg ggtgtgctac atcatacatt cttccagaac ttcaggatgg gctatctttt catgtctcta ttgccaaaaa tgacaccatc tatattttag gaggacattc acttgccaataatatccggc ctgccaacct gtacagaata agggttgate tteccetggg tageceaget gtgaattgea eagtettgee aggaggaate tetgteteea gtgeaateet gactcaaact aacaatgatg aatttgttat tgttggtggc tatcagcttg aaaatcaaaa aagaatgatc tgcaacatca tetetttaga ggacaacaag atagaaatte gtgagatgga gaccccagat tggaccccag acattaagca cagcaagata tggtttggaa gcaacacggg aaatggaact gtttttcttg gcataccagg agacaataaa caagttgttt cagaaggatt ctatttctat atgttgaaat gtgctgaaga tgatactaat gaagagcaga caacattcac aaacagtcaa acatcaacag aagatccagg ggattccact ccctttgaag actctgaaga attttgtttc agtgcagaag caaatagttt tgatggtgat gatgaatttg acacctataa tgaagatgat gaagaagatg agtctgagac aggctactgg attacatgct gccctacttg tgatgtggat atcaacactt gggtaccatt ctattcaact gagctcaaca aacccgccat gatctactgc tctcatgggg atgggcactg ggtccatgct cagtgcatgg atctggcaga acgcacactc atccatctgt cagcaggaag caacaagtat tactgcaatg agcatgtgga gatagcaaga gctctacaca ctccccaaag agtcctaccc ttaaaaaagc ctccaatgaa atccctccgt aaaaaaggtt ctggaaaaat cttgactcct gccaagaaat cctttcttag aaggttgttt gattagtttt gcaaaagcct ttcagattca ggtgtatgga atttttgaat ctatttttaa aatcataaca ttgattttaa aaatacattt ttgtttattt aaaatgccta tgttttcttt tagttacatg aattaagggc cagaaaaaag tgtttataat gcaatgataa ataaagtcat totagaccot atacattttg aaaatatttt acccaaatac toaatttact aatttattot toactgagga tttctgatct gattttttat tcaacaaacc ttaaacaccc agaagcagta ataatcatcg aggtatgttt atatttatta tatgagtett ggtaacaaat aacetataaa gtgtttatga caaatttage caataaagaa attaacacce aaaagaatta aattgattat tttgtgcaac ataacaattc ggcagttggc caaaacttaa aagcaagatc tactacatcc cacattagtg ttetttatat acetteaage aaceetttgg attatgecea tgaacaagtt agttteteat agetttacag atgtagatat aaatataaat atatgtatac atatagatag ataatgttet eeaetgacae aaaagaagaa ataaataate tacatcaaaa aaaaaaaaa aaaaaaaaaa aaaa

SEQ ID NO: 4. RAG 2 Amino Acid Sequence

MSLQMVTVSNNIALIQPGFSLMNFDGQVFFFGQKGWPKRSCPTGVFHLDVKHN
HVKLKPTIFSKDSCYLPPLRYPATCTFKGSLESEKHQYIIHGGKTPNNEVSDK
IYVMSIVCKNNKKVTFRCTEKDLVGDVPEARYGHSINVVYSRGKSMGALFG
GRSYMPSTHRTTEKWNSVADCLPCVFLVDFEFGCATSYILPELQDGLSFHVS
IAKNDTIYILGGHSLANNIRPANLYRIRVDLPLGSPAVNCTVLPGGISVSSAIL
TQTNNDEFVIVGGYQLENQKRMICNIISLEDNKIEIREMETPDWTPDIKHSKI
WFGSNTGNGTVFLGIPGDNKQVVSEGFYFYMLKCAEDDTNEEQTTFTNSQT
STEDPGDSTPFEDSEEFCFSAEANSFDGDDEFDTYNEDDEEDESETGYWITC
CPTCDVDINTWVPFYSTELNKPAMIYCSHGDGHWVHAQCMDLAERTLIHLS
AGSNKYYCNEHVEIARALHTPQRVLPLKKPPMKSLRKKGSGKILTPAKKSF
LRRLFD

## SEQ ID NO: 5. CD154 nucleotide sequence

1 ettetetgee agaagatace attteaactt taacacagea tgategaaac atacaaceaa 61 actteteece gatetgegge eaetggaetg eccateagea tgaaaatttt tatgtattta 121 cttactgttt ttcttatcac ccagatgatt gggtcagcac tttttgctgt gtatcttcat 181 agaaggttgg acaagataga agatgaaagg aatcttcatg aagattttgt attcatgaaa 241 acgatacaga gatgcaacac aggagaaaga teettateet tactgaactg tgaggagatt 301 aaaagccagt ttgaaggctt tgtgaaggat ataatgttaa acaaagagga gacgaagaaa 361 gaaaacagct ttgaaatgca aaaaggtgat cagaatcctc aaattgcggc acatgtcata 421 agtgaggcca gcagtaaaac aacatctgtg ttacagtggg ctgaaaaagg atactacacc 481 atgagcaaca acttggtaac cctggaaaat gggaaacagc tgaccgttaa aagacaagga 541 ctctattata tctatgccca agtcaccttc tgttccaatc gggaagcttc gagtcaagct 601 ccatttatag ccagcetetg cetaaagtee cceggtagat tegagagaat ettacteaga 661 getgeaaata eccaeagtte egeeaaacet tgegggeaac aateeattea ettgggagga 721 gtatttgaat tgcaaccagg tgcttcggtg tttgtcaatg tgactgatcc aagccaagtg 781 agccatggca etggetteae gteetttgge ttaeteaaae tetgaaeagt gteaeettge 841 aggetgtggt ggagetgaeg etgggagtet teataataea geaeageggt taageeeace 901 ccctgttaac tgcctattta taaccctagg atcctcctta tggagaacta tttattatac 961 actecaagge atgtagaact gtaataagtg aattacaggt cacatgaaac caaaacggge 1021 cetgetecat aagagettat atatetgaag eageaaceee aetgatgeag acateeagag 1081 agtectatga aaagacaagg ceattatgea eaggttgaat tetgagtaaa eageagataa 1141 cttgccaagt tcagttttgt ttctttgcgt gcagtgtctt tccatggata atgcatttga 1201 tttatcagtg aagatgcaga agggaaatgg ggagcctcag ctcacattca gttatggttg 1261 actetgggtt cetatggeet tgttggaggg ggeeaggete tagaaegtet aacaeagtgg 1321 agaaccgaaa cccccccc ccccccgcc accctctcgg acagttattc attctctttc 1381 aatetetete tetecatete tetettteag tetetetete teaacetett tetteeaate 1441 tetetttete aatetetetg ttteeetttg teagtetett eeeteecea gtetetette 1501 teaatecece tttetaacae acacacaea acacacaea acacacaea acacacaea 1561 acacacaca acacacaca agagtcagge egttgctagt cagttctctt etttccacce 1621 tgtccctatc tctaccacta tagatgaggg tgaggagtag ggagtgcagc cctgagcctg 1681 cccactcctc attacgaaat gactgtattt aaaggaaatc tattgtatct acctgcagtc 1741 tccattgttt ccagagtgaa cttgtaatta tcttgttatt tattttttga ataataaaga 1801 cctcttaaca ttaaaa

SEQ ID NO: 6. CD154 amino acid sequence

MIETYNQTSPRSAATGLPISMKIFMYLLTVFLITQMIGSALFAVYLHRRLDKIEDE RNLHEDFVFMKTIQRCNTGERSLSLLNCEEIKSQFEGFVKDIMLNKEETKKENSF EMQKGDQNPQIAAHVISEASSKTTSVLQWAEKGYYTMSNNLVTLENGKQLTVK RQGLYYIYAQVTFCSNREASSQAPFIASLCLKSPGRFERILLRAANTHSSAKPCGQ QSIHLGGVFELQPGASVFVNVTDPSQVSHGTGFTSFGLLKL